# EXPLORATORY ANALYSIS OF RAIN FALL DATA

# IN INDIA FOR AGRICULTURE

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**CONTENT:**

# ABSTRACT

Accurate rainfall prediction has become very complicated in recent times due to climate change and variability. The efficiency of classification algorithms in rainfall prediction has flourished. The study contributes to using various classification algorithms for rainfall prediction in the different ecological zones of Ghana. The classification algorithms include Decision Tree (DT), Random Forest (RF), Multilayer Perceptron (MLP), Extreme Gradient Boosting (XGB) and K-Nearest Neighbors (KNN). The dataset, consisting of various climatic attributes, was sourced from the Ghana Meteorological Agency spanning 1980 – 2019. The performance of the classification algorithms was examined based on precision, recall, f1-score, accuracy, and execution time with various training and testing data ratios. On all three training and testing ratios: 70:30, 80:20 and 90:10, RF, XGB and MLP performed well, whereas KNN performed least across all zones. In terms of the execution time of the models, Decision Tree is consistently portrayed as the fastest, whereas MLP used the most run time.

# INTRODUCTION

Accurate and timely rainfall prediction is expected to inject a new intervention phase to the affected sectors accosted with the negative propensities of rainfall extremes. These critical sectors include but are not limited to energy, agriculture, and others, which are greatly affected by rainfall. A plethora of scholarly research has demonstrated that the duration and intensity of rainfall cause major climate-related disasters. The manifestation of the impact of rainfall includes drought, floods, among others and its associated effects. For example, in 2009, torrential rains affected almost 600,000 people in Senegal, Niger, Burkina Faso and Ghana.

# LITERATURE REVIEW

[1]. **Title:** Analysis of Rainfall Trends and Its Relationship with SST Signals in the Lake Tana Basin.

**Introduction:** The impacts of climate change and climate variability on human life have led the scientific community to monitor the behavior of weather and climate variables at different spatial and temporal scales.is paper explores seasonal and annual trends of rainfall in the Lake Tana basin (LTB) and their teleconnections with global sea surface temperatures (SSTs) over the period between 1979 and 2015.The nonparametric Mann–Kendall test and Sen's slope estimate are applied to the rainfall data collected from the National Meteorology Agency (NMA) of Ethiopia for detecting and estimating rainfall trends. Additionally, Pearson's correlation coefficient method is used to determine the effect of SST variations on rainfall.

**Advantages:** The assessment of rainfall trends indicates that the amount of annual rainfall in the Lake Tana basin is increasing,

**Disadvantage:** The rate of increase is not statistically significant.

[2]. **Title:** Long term Analysis of Rainfall data of Fatehabad Districts of Haryana

**Introduction:** The rainfall received in an area is an important parameter which determines the availability of required quantity of water to meet various types demand including agricultural, industrial, domestic water supply and power generation as well.

Thus, rainfall has profound effect on the agriculture and related industry and power generation of the country like India. In a nutshell the economy, energy and food security of the country is largely being controlled by availability of adequate amount of water or normal rainfall. The amount rainfall hugely varies over time and space in India. In India, rainfall generally occurs in monsoon season (June-September) with erratic rainfall during rest of the months of the year.

**Advantage:** The rainfall has increased for all seasons except winter during and deficient and excess rainfall have occurred almost with equal frequency during the study period.

**Disadvantage:** Moreover, due to changing global meteorological phenomena and climate change the unset and offset of monsoon has also badly affected over the last few decades.

[3]. **Title:** Rainfall variability and its implications for agricultural production

**Introduction:** Rainfed agriculture is practiced in the central clay plains of Sudan and is affected by the high rainfall variability in time and space within and between seasons. Yearly rainfall has relatively low variability compared to monthly variability. According to annual rainfall totals, it was possible to classify stations into two groups; one with annual rainfall more than 600 mm and the second with rainfall ranging between 500 to 600 mm. In both groups, the majority of rainfall (60%) occurred during July and August.Farmers in areas having high rainfall and extended growing season could grow suitable crops and varieties and their appropriate management practices should be

implemented. In areas of low rainfall and short growing seasons farmers could grow crops of short maturing varieties and water harvesting techniques.

[4]. **Title:** Analysis of rainfall data for storage and irrigation planning in humid south-eastern plain (Rajasthan)

**Introduction:** The amount and distribution of rainfall in any particular area are very helpful in sound crop planning (Singh and Sharma, 2003). The average rainfall of the region is generally considered as the basis for deciding irrigation management and cropping pattern. But it is having been observed that the knowledge of mean annual rainfall may not be that much useful to decide irrigation and water management activities for crop production. Long term analysis is vital for firm planning and execution of crop cultivation. Various authors have analysed rainfall data for crop planning and irrigation management.

[5]. **Title:** Frequency analysis of extrem rainfall events

**Introduction:** The study of the rainfall probability distributions is important to estimate large events and their probability of occurrence. This paper presents the usefulness of extreme hydrological frequency analysis when the occurrences are independent in time to describe the likelihood of extreme events over the time horizon. The occurrence of many extreme events in hydrology cannot be forecasted on the basis of deterministic informa-tion with sufficient skill and lead time. In such cases, a probabilistic approach is required to incorporate the effects of such phenomena into decisions. If the occurrences can be assumed to be independent in time, i.e., the timing and

magnitude of an event bears no relation to preceding events, extreme hydrologic Q1 frequency analysis (HFA) can be used to describe the likelihood of any one or a combination of events over the time horizon of a decision. HFA is useful for a variety of engineering applications including hydraulic and municipal structure design (culverts, storm sewers) and land-slide hazard evaluation.

[6].**Title:**A Data – Driven Approach for Accurate Rainfall Prediction

**Introduction:** Rainfall initiation is a dynamic process and is influenced by a myriad of atmospheric parameters. The water vapor content of the atmosphere is one such important parameter. It is generally explained in terms of precipitable water vapor (PWV)—a measure of the total water vapor stored in a column of the atmosphere. It is an important indicator of water vapor climatology in the lower troposphere. Nowadays, global positioning system (GPS) signal delay is extensively being used to estimate PWV, because GPS meteorology offers improved spatial and temporal resolutions for water vapor variations compared to other existing techniques such as radiosondes, microwave radiometers, and satellite-based instruments. Radiosondes are generally launched only twice a day and are not released during severe weather events. Microwave radiometers have sparse station distribution as the instrument cost is high. They are of limited value in climate studies, particularly in predicting and tracking heavy rainfall cases, because radiometers can provide reliable PWV readings only under no-rain conditions. Similarly, satellite-based PWV retrieval has poor temporal

resolution. Compared to these technologies, GPS provides good spatiotemporal resolution and is suitable for all weather conditions.

# REFERENCES

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THANK YOU